

The Harvey Monroe Hall
Natural Area

Jens C. Clausen

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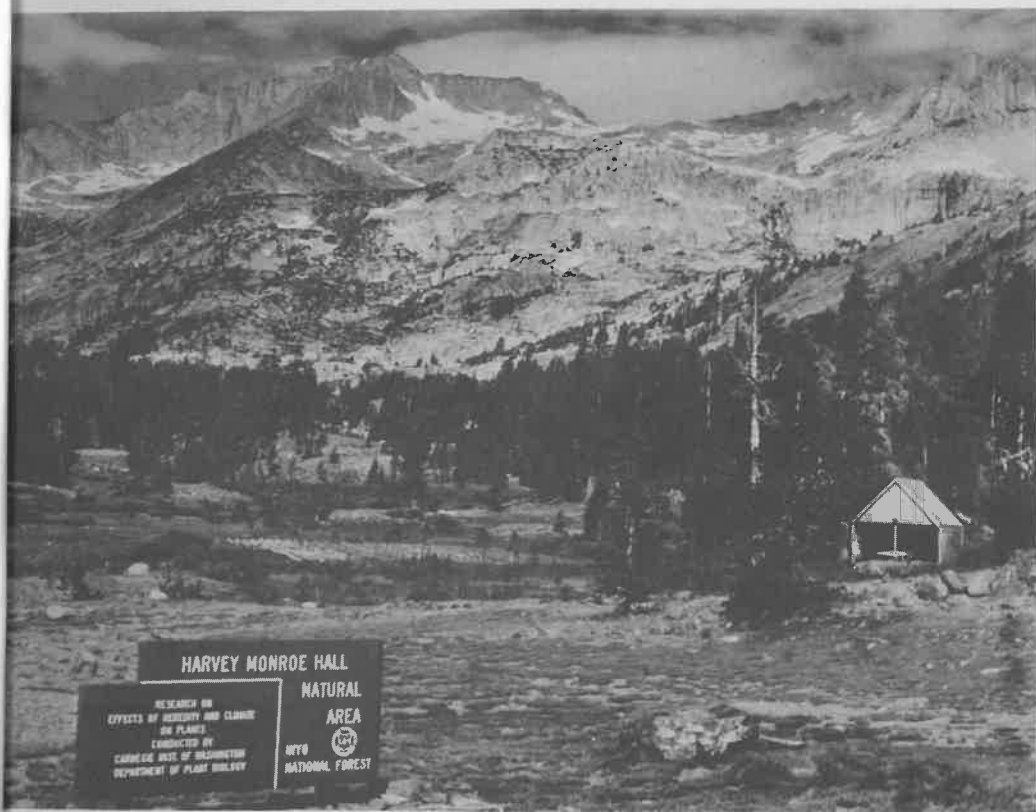
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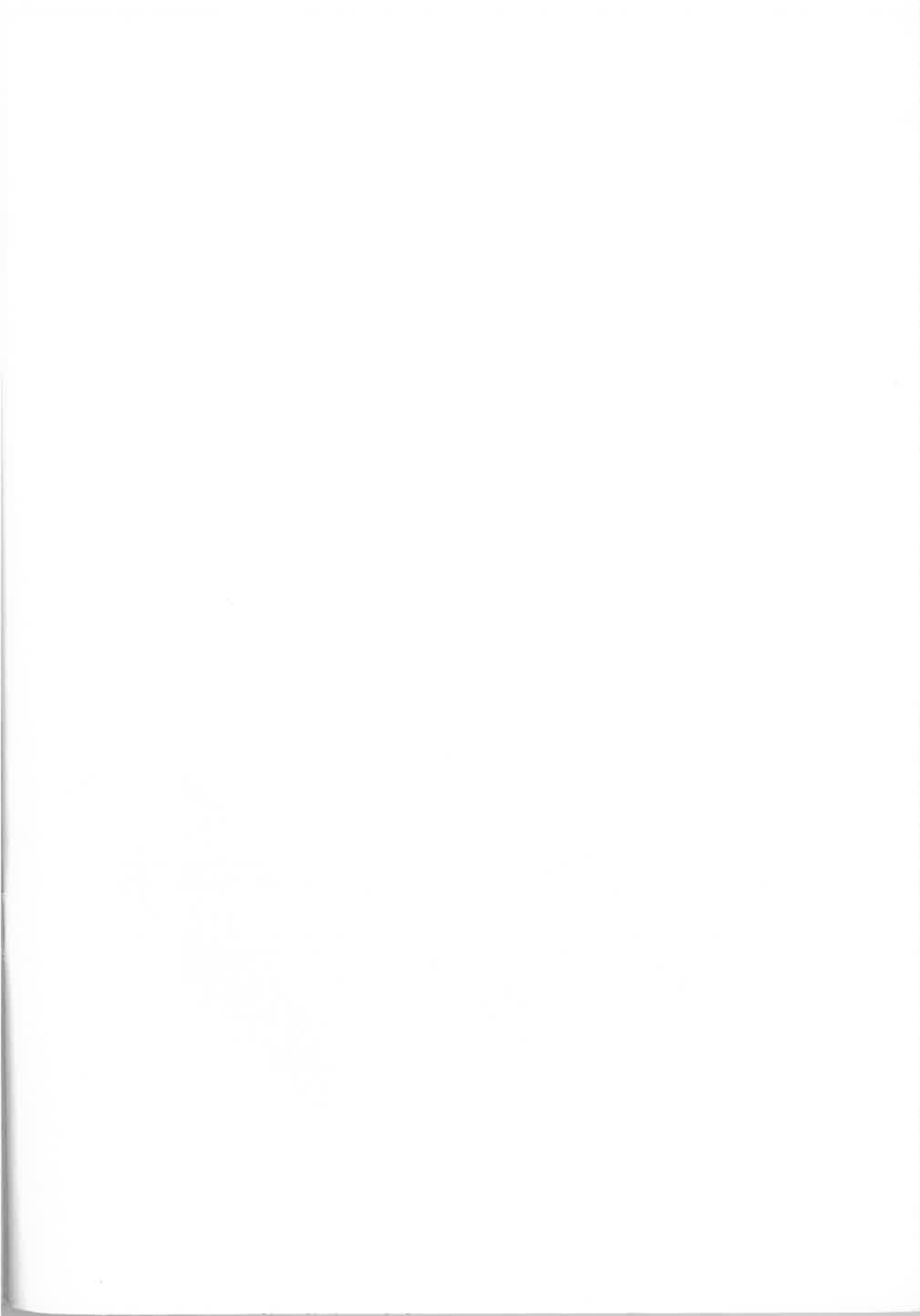
THE HARVEY MONROE HALL NATURAL AREA

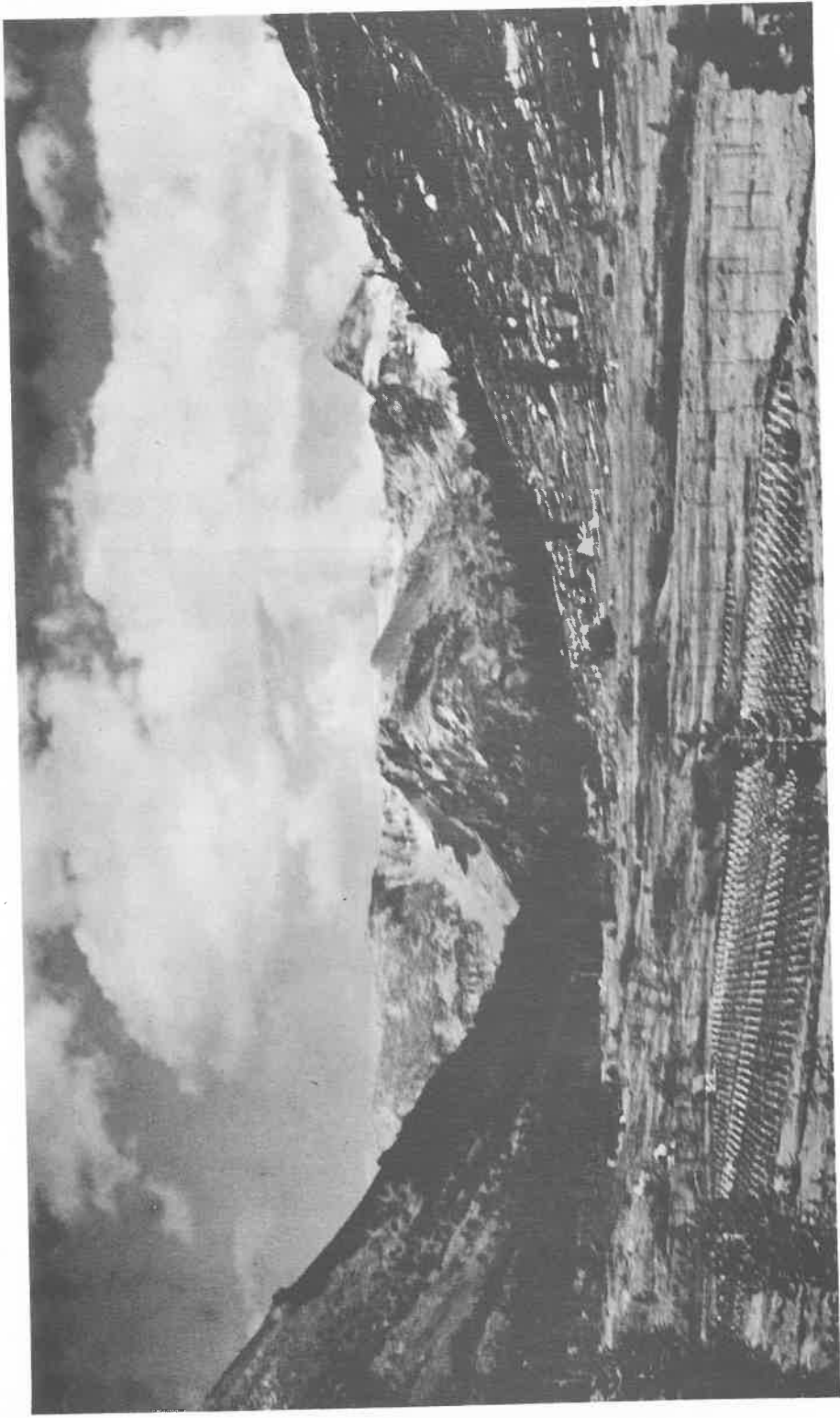
JENS CLAUSEN



DEPARTMENT OF PLANT BIOLOGY
CARNEGIE INSTITUTION OF WASHINGTON







Frontispiece: Carnegie Institution Timberline transplant garden, looking south towards Mt. Dana in late fall, Sept. 19, 1955; an early snow storm is breaking up. Left, Tioga Peak; right, east end of Middle Ridge.

Cover photograph: Slate Creek Valley, the central valley of the Harvey Monroe Hall Natural Area, in late spring, Aug. 6, 1963, looking west towards Mt. Conness. Subalpine forest of Pinus murrayana to the right. Transplant garden beyond the U. S. Forest Service sign.

THE HARVEY MONROE HALL NATURAL AREA

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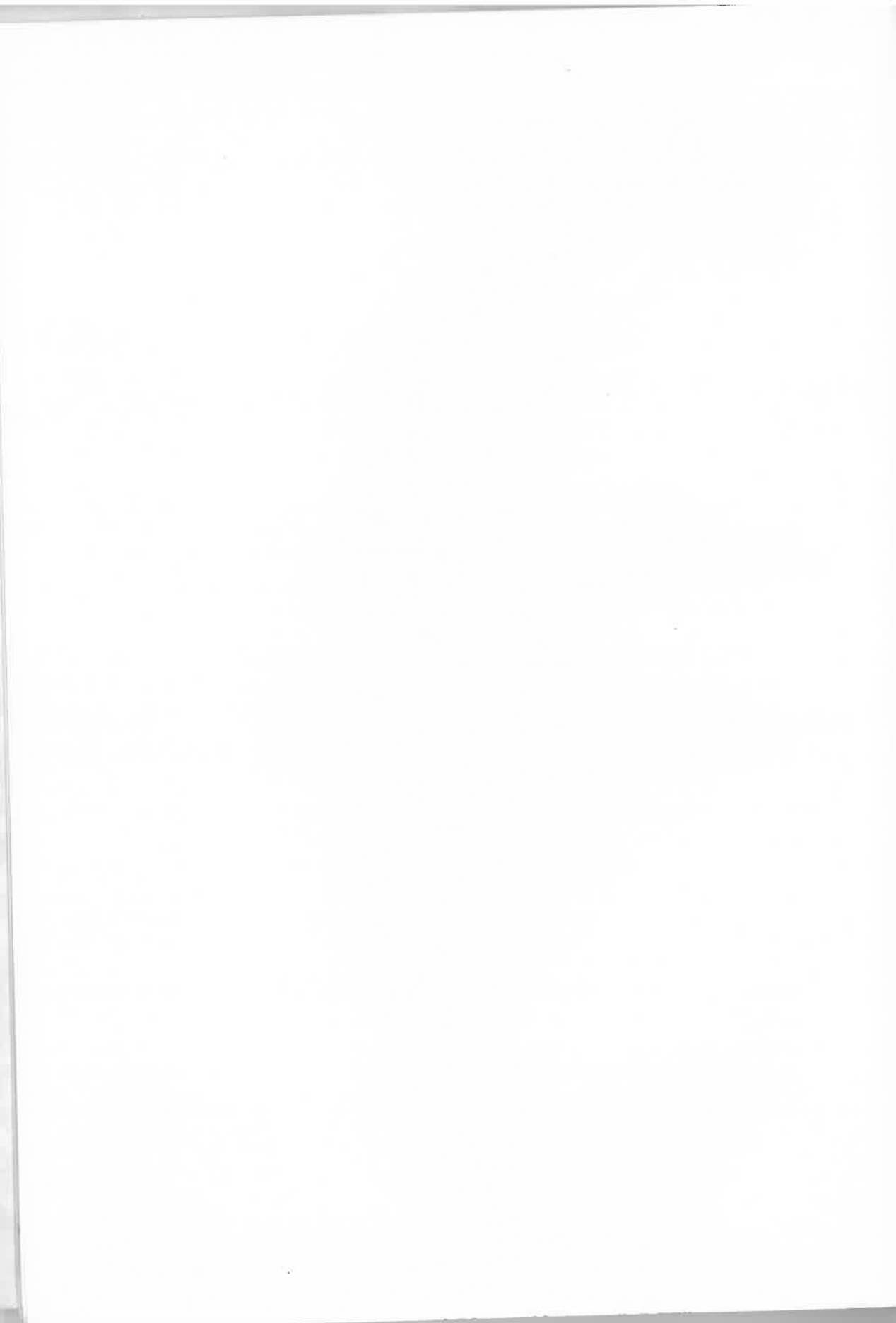
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HARVEY MONROE HALL NATURAL AREA

The Harvey Monroe Hall Natural Area was established in 1932 by the United States Forest Service in cooperation with the Carnegie Institution of Washington for the purpose of maintaining an area "where natural conditions will be preserved virtually free from disturbances excepting those necessary for the prosecution of scientific research." It surrounds the Timberline experiment station of the Carnegie Institution of Washington and was named for the late Dr. H. M. Hall who proposed the establishment of the Natural Area in 1931. When the Natural Area was established it had been somewhat denuded by sheep grazing, but the native vegetation has recovered over the past 36 years.

The Hall Area is located at about 38° N. Latitude and $119^{\circ} 18'$ W. Longitude, varying in altitude between 3000 and 4000 m (10,100-13,100 ft.). It is at the western edge of the Mono Basin, approximately 10 km north of Tioga Pass. It lies between Yosemite National Park on the west and Hoover Wild Area on the east, and includes approximately 20 km^2 (7 mi^2) of recently glaciated terrain. White Mountain, Mt. Conness, and North Peak lie on the border with Yosemite Park, and the Conness Glacier is still active. The western third of the area is underlain by granitic rocks of the Sierra Nevada batholith, and the eastern two-thirds are underlain by tightly folded, highly metamorphosed sedimentary rocks. The transition from subalpine to alpine vegetation is within the natural area.

The Carnegie Institution of Washington has three experiment stations along a 300-km transect across central California along latitude 38° N. These

include (1) a lowland station at Stanford University in the Coast Ranges at 30 m altitude; (2) a mid-altitude station at Mather on the west flank of the Sierra Nevada at 1400 m altitude; and (3) a subalpine station, Timberline, at 3000 m in the Hall Area on the east side of the Sierra Nevada. The climates at the three stations are remarkably different; Stanford has essentially a full year's growing season, Mather a winter approximately 5 months long, and Timberline a 10-month winter and a 2-month growing season in which spring, summer, and fall are telescoped into the period from about July 15 to September 15 (9).

In only a few places in the world does the vegetation change so rapidly over such a short distance. The pines, for example, change species nine times from the coast to the western edge of the Great Basin. Some perennial herbs, on the other hand, have negotiated this distance without change of species, but we have found that they have evolved a series of climatic races, each race adjusted to a climatic zone across the transect comparable to the zone occupied by a single pine species.

Transplant Experiments

One of the main purposes of the transplant experiments has been to discover the extent to which the changes in plant species along the transect are hereditary and the extent to which they are induced by differences in environment such as climate (1, 3, 4). Another purpose has been to explore the hereditary and physiological mechanisms that adjust plants to such different climates (6).

Plants of widespread perennial species have been studied. Perennial plants have the advantage that they can be vegetatively divided and divisions of the same plant can be planted at the three stations, assuring that the heredity

remains the same although the climate is different. Likewise, plants of one species but from contrasting environments along the transect can be planted beside each other in the garden where they remain distinct, indicating that their heredities differ.

Altitudinal and Latitudinal Races

In general, plants native to the Coast Ranges and the foothills of the Sierra Nevada die during the first winter after they have been transplanted to the Timberline station, but they may survive at the mid-altitude station, although with reduced vigor. Plants native to mid-altitudes in the Sierra Nevada tend to survive with reduced vigor in the Coast Ranges at Stanford, and some may survive a few years at Timberline although they are unable to mature seed during the brief summer there. Plants from high altitudes which are successful and mature seed at the Timberline station may be vigorous or die at the mid-altitude station, depending upon the species, and are unsuccessful at Stanford although they may be kept alive for a couple of years.

Using a perennial herb such as the milfoil or yarrow (Achillea millefolium complex) of the sunflower family as an example, we found a minimum of eleven physiologically distinct climatic races of this species across the 300-km transect from the coast to the Great Basin (3). Milfoils ranging from those native to latitudes north of the Arctic Circle in Iceland, northernmost Norway, and Lapland, to those native at latitude 20° N. in southeastern Mexico, have been grown and tested at the transplant stations. The results indicate that besides the altitude races probably hundreds of latitudinal races exist within such a widespread species.

Experiments with many other kinds of plants, such as a cinquefoil (Potentilla) of the rose family, a monkeyflower (Mimulus) of the snapdragon family (6), a tufted hairgrass (Deschampsia), and a blue grass (Poa) of the grass family, have shown that the principle of climatic and ecologic races is a universal one in the plant kingdom (4).

Plants of diverse families and native to many climates have therefore evolved hereditarily distinct races that differ in their ability to survive in contrasting climates (5). Each race contains much individual variation that adjusts the race to local and seasonal differences in environment and that provides the raw material for further natural selection.

The appearance of a plant is the resultant of both its heredity and its environment (1). Nearly all plants modify in appearance from station to station, but at any one station the races native to different climates differ markedly from each other.

Hereditary Mechanisms of Climatic Races

Low-altitude and high-altitude races of the same species can be crossed. The first generation of interracial hybrids is generally vigorous and fertile (6). Unlike the parent species such hybrids are able to survive indefinitely at all three stations, so that the heredities of the parental races appear to complement each other.

In the second and later generations such interracial hybrids release great variability, exceeding the variations found in natural populations. The recombinations between the parental traits are nevertheless not random. The heredities of the parental races are carried by the chromosomes in such a way that

the parental heredities tend to cohere (4, 6, 10). Peculiar interlocking mechanisms of several kinds tend to preserve the delicate adjustments of the heredity to the environment so that these are not destroyed with each new generation. The interlocking is not so absolute, however, that it prevents evolution from keeping pace with the developments in a changing world.

The natural races of plants serve therefore as reservoirs of potential variability that can be released for natural selection when changes in the environment such as mountain building bring hitherto separated races together. The inheritance mechanism of races of wild plants maintains a balance between potential variation and moderate restraints in variability after crossing. Major geologic changes favor shifts in the balance towards greater variability.

The physiological mechanisms that distinguish natural races are regulated by heredity and are studied in more detail at the Stanford laboratory of the Carnegie Institution. Greenhouses, controlled temperature chambers, and sophisticated instruments for the study of photosynthesis under exactly controlled conditions supplement the experiments at the transplant stations.

Vegetation Studies Within the Hall Area

The highly varied topography of the Hall Area provides niches for plants of diverse origin, and it is inhabited by about 350 species of flowering plants and ferns—unusually many for such a high altitude (9). Species complexes belonging to the circumpolar high-latitude vegetation have come south through the mountains of western North America; relatives of plants native to the mild Pacific coasts have ascended the mountains, evolving climatic races that enabled them to cross the passes to the Mono Basin; others that are native to

the arid and continental Great Basin and Rocky Mountains have ascended from the east or have risen with the mountains, joining a group of local high-altitude species that may have existed in refugia during the period of heaviest glaciation. Species of such diverse origins find climatic and soils niches within the Hall Area, enabling them to live closely together, resulting in swarms of hybrid populations.

Recent population studies of three conifer species (8) have revealed that each has evolved subalpine tree races near the 3000-m altitude level, and alpine, horizontal elfinwood races (krummholz) above the tree line at 3000 — 3300 m, depending upon the species and the slope exposure. The three conifers are whitebark pine (Pinus albicaulis), a close relative of the P. cembra of the Swiss Alps and Altai Mountains, the lodgepole pine, P. murrayana, closely related to P. silvestris, the Scots pine of northern Europe, and a hemlock, Tsuga mertensiana. The subalpine and alpine races of each of these conifers interbreed, but severe natural selection tends to eliminate the intermediates except near the border zone.

LIST OF VASCULAR PLANTS GROWING WITHIN THE
HARVEY MONROE HALL NATURAL AREA

A conservative species concept has been used. Many species have been listed as clusters of closely related species that in the past may have shared a common gene pool (5,10). Such an arrangement clarifies evolutionary-distributional concepts.

The species of the Hall Area are divided into three major groups according to their geographic distribution, namely:

Group I: species clusters of the circumpolar high latitude vegetation,

Group II: species native to the Pacific slope, and

Group III: species clusters occupying the region of the Great Basin.

Presumably they may have entered the high altitudes of the Hall Area from different sides, adjusting to the climate as the mountains rose during the last 1-2 million years. A fourth group is marked by an asterisk (*) and consists of high altitude local endemics that possibly existed on island refugia surrounded by the glaciers of the Glacial period.

The species clusters of each major group tend to spill over in both directions from the peaks of the Sierras. By this process a few clusters have reached both the Pacific and the Atlantic coasts although they have not become circumpolar. These highly adaptable complexes are included in Group III, which in part becomes a diverse catch-all.

In developing the plant list of the Hall Area the author owes a deep debt of gratitude to his colleagues of many years, Drs. David D. Keck, William M. Hiesey, and Malcolm A. Nobs, who greatly contributed to the collection and determination of the plants. Mr. John Thomas Howell of the California Academy of Sciences and Dr. Carl W. Sharsmith of the San Jose State College, Range Ecologist, intimately acquainted with the vegetation of the high Sierra Nevada, have studied the preliminary list carefully and provided suggestions and corrections gratefully appreciated.

Most commonly A California Flora, Philip A. Munz and D. D. Keck, Berkeley, 1959, has been used as authority. For the circumpolar group Flora of Alaska and Yukon, Eric Hultén, Lund, 1940-1950, was utilized. Numerals in parentheses (1) refer to the listed publications and papers by the Carnegie group of investigators. (See References Cited.)

A list of mosses of the Hall Area was published in 1958 by Leo F. Koch, but the mosses are not included in the present list.

Note: The Hall Area native of the species cluster is underlined and the author of the taxonomic entity is listed.

LIST OF SPECIES COMPLEXES

Note: The Hall Area entity is underlined.

I. CIRCUMPOLAR SPECIES COMPLEXES

PTERIDOPHYTA

- Cryptogramma* *crispa-acrostichoides* R. Br. (= *Osmunda crispa* L.)
ssp. *crispa*: Iceland, Fennoskandia-Pyrenees-Apennines-Urals-Afghanistan
ssp. *raddeana*: Transbaikalia-central China
ssp. *acrostichoides*: Yesso-Sachalin-Kuriles-Kamtschatka-Alaska-Yukon-S. to California-Humboldt-Modoc-Sierras-White Mts.-San Jacintos-N. Mexico-N. of Great Lakes-Labrador
Cystopteris *fragilis* (L. Bernh. Cosmopolitan)
Phegopteris (*Athyrium*) *alpestris* Hoppe var. *americanum*
Pteridium *aquilinum* (L.) Kuhn. Coastal to 10,600 ft. Also S. Hemisphere
Botrychium *lunaria-simplex* Hitchc.: Eurasia-N. America
Woodsia alpina-scopulina D. C. Eat.: Eurasia-N. America

CONIFERAE

- Juniperus communis* L. - *montana* Ait.: Eurasia-N. America
Tsuga *mertensiana* (Bong.) Sarg. - *canadensis* - *araragi-brunoniana* complex (7, 8)
Pinus cembra-sibirica-pumila-albicaulis Engelm. complex: Eurasia-N. America (7, 8)
P. silvestris-montana-pauciflorus-contorta - *murrayana* Grev. - *banksiana* (7, 8)

SPARGANIACEAE

- Sparganium* *angustifolium* Michx. Acc. to Hulten: Kamtschatka-Labrador-Eurasia

GRAMINEAE

- Agropyron caninum* L.: Eurasia; subsecundum - *trachycaulum* Malte: N. America
Calamagrostis *canadensis* Beauv.: Asia + N. America - *C. purpurea*: Trinity: Europe
C. inexpansa Gray: N. America; *lapponica* Hartm.: Eurasia
Deschampsia *caespitosa* (L.) Beauv. - *beringensis*: Eurasia-N. America - S. America

HALL AREA, Plant List

I. CIRCUMPOLAR SPECIES COMPLEXES (cont.)

GRAMINEAE (cont.)

- Festuca ovina* L.
Hordeum nodosum L. - *brachyantherum* Newskii; coastal to 11,000 ft.
Phleum alpinum L. - the tetraploid sp. (= *P. commutatum* Gaud.) (1)
Lapland-Alps-Scotland-Japan-Alaska-N. America: 5000-11,000 ft.
Poa pratensis L. - arctica-alpigena complex; sea level-12,000 ft.:
Eurasia-N. America (4)
Trisetum spicatum (L.) Richt.: Alaska-San Jacinto Mts.: 7200-13,000 ft.

CYPERACEAE

- Carex canescens* L.: Eurasia-N. America-S. America
C. capitata L.: Eurasia-N. America
C. macloviana d'Urv. - *festivella* Mackze. - festiva: Eurasia-N. America-S. America
C. rostrata Stokes: Eurasia-N. America
Scirpus (*Heleocharis*) *palustris* Lightf.: N. America-Eurasia

JUNCACEAE

- Luzula divaricata* Wats. - parviflora complex: N. America-Eurasia
L. multiflora Ehrh.: Eurasia-N. America
L. oresteria Carl Sharsm. - arctica Blytt (= *L. nivalis* Laest.)
N. Eurasia-N. America
L. spicata (L.) D. C. - N. Eurasia-N. America

LILIACEAE

- Tofieldia glutinosa-occidentalis* Wats. - pusilla complex: Eurasia-N. America
Veratrum album L. - *californicum* Durand complex: Eurasia-N. America

ORCHIDACEAE

- Habenaria dilatata* (Pursh.) Hook. - *leucostachys* (Lindl.) Ames: to 11,000 ft.
N. America: Sierras-Panamint-White Mts. - Inyo-Mono Cos. - B. C. -
Montana-Alaska-Labrador-Newfoundland-Greenland-Atlantic-Rocky Mts.;
Asia: Commander Islands (Hultén)
Europe: *H. alba* acc. to Böcher
H. hyperborea (L.) R. Br.: Inyo-Mono Cos. - Alaska-Rocky Mts. - Atlantic-Greenland
Europe: Iceland (= *Orchis* h. L.; *Limnorchis* h. Rydb.)
H. saccata Greene (not in Hall Area) (= *Limnorchis* s. Rydb.): below 8000 ft.:
California N. Coast Cos. - N. Mexico-B. C. - Alaska

HALL AREA, Plant List

I. CIRCUMPOLAR SPECIES COMPLEXES (cont.)

ORCHIDACEAE (cont.)

- H. sparsiflora Wats. (=Limnorchis sparsiflora Rydb.; =L. laxiflora Rydb.); 4000-11,000 ft.; is in Hall Area a fairly clear species:
Sierras-Coast R. San Diego-N. Coast R.-Washington-Arizona-Rocky Mts.
These 4-5 Orchid species are closely related. They differ by variations in color (green to white), in lip shape and spur shape, and in length of spurs. Confusion has been compounded by the species moving through continents and time and by referring them to various genera, viz., Orchis, Platanthera, Limnorchis, and Habenaria. The pollinating organisms have confused botanists.
Spiranthes romanzoffiana C. et S.: N. America: Sierras-Coast R.-Alaska-Yukon-Hudson Bay-Labrador-Connecticut-New York-S. Dakota-Minnesota
Europe: Ireland-Scotland; Montane-10,000 ft.

SALICACEAE

- Populus tremula-jezoensis-tremuloides Michx.: Eurasia-N. America (7)
Salix arctica-anglorum Cham.-petrophila complex: Eurasia-N. America
S. reticulata L.: High latitude and altitude: Eurasia-N. America
S. phyllifolia L.-pulchra-planifolia-monica Bebb complex: Eurasia-N. America
S. glauca L.-orestera Schneid.-brachycarpa: Eurasia-N. America

POLYGONACEAE

- Oxyria digyna L. High latitude and altitude: Eurasia-N. America
Polygonum viviparum L.-bistorta L.-bistortoides Pursh.: Eurasia-N. America
Rumex acetosa L.-lapponicus-paucifolius Nutt.-hastatulus: Eurasia-N. America

CARYOPHYLLACEAE

- Sagina linnaei Presl.: Eurasia-N. America
Stellaria crispa C. et S. + W. N. America-longipes Goldie (?): Alaska-Greenland-Eurasia

RANUNCULACEAE

- Thalictrum fendleri Engelm.: N. America; T. alpinum L.-Mono Co.: circumpolar (1)

CRASSULACEAE

- Sedum (Rhodiola) rosea (L.) Scop. n=11, Europe-E. N. America-integrifolia Raf. n=18, E. Asia-W. N. America

HALL AREA, Plant List

I. CIRCUMPOLAR SPECIES COMPLEXES (cont.)

SAXIFRAGACEAE

- Parnassia palustris* L.: Eurasia-N. America-californica Gray: Oregon-California
Saxifraga nivalis L.: Eurasia-N. America-aprica Greene: Oregon-California-Nevada
S. rivularis L.: Eurasia-N. America-debilis Engelm.: B. C.-Rocky Mts.

ROSACEAE

- Geum aleppicum*: Eurasia-N. America-macrophyllum Willd.: Kamtschatka-Labrador
Potentilla fruticosa L. complex: N. America (n=7); Eurasia (n=14)
P. rupestris L. Europe-glandulosa Lindl. -nevadensis-arguta, N. America; all n=7 (1, 4, 6)
Sibbaldia procumbens L.: Eurasia-N. America
Sorbus aucuparia L. complex: amurensis-scopulina Greene-canadensis-decora (7)

LINACEAE

- Linum perenne* L. -lewisii Pursh: Eurasia-N. America

CALLITRICHACEAE

- Callitriche verna* L.: Eurasia-N. America

ONAGRACEAE

- Epilobium anagallidifolium* Lam. complex: Eurasia-N. America
E. angustifolium L. complex: Eurasia (incl. Greenland): n=18; N. America: n=32 (1)
E. latifolium L.: Eurasia-N. America, Alaska-Labrador

ERICACEAE

- Cassiope tetragona* (L.)-mertensiana Don: Eurasia-N. America
Ledum palustre L. -groenlandicum-glandulosum Nutt.: Eurasia-N. America (W. N. America)
Phyllodoce coerulea (L.)-breweri (Gray) Heller: Eurasia-N. America; breweri: Sierras-Tulare
Pyrola minor L.: Eurasia-N. America
P. secunda L.: Eurasia-N. America

GENTIANACEAE

- Gentiana amarella* L., Circumboreal: Eurasia-N. America

HALL AREA, Plant List

I. CIRCUMPOLAR SPECIES COMPLEXES (cont.)

GENTIANACEAE (cont.)

G. detonsa Rottb. -holopetala Holm. -simplex Gray complex: N. W. Europe
Greenland-N. America

SCROPHULARIACEAE

Limosella aquatica L.: vernal pool: Eurasia-N. America
Veronica alpina L., n=9: Eurasia-N. Labrador-wormsholdii R. et S.,
n=18: N. America; both in Greenland

CAPRIFOLIACEAE

Sambucus racemosa L. -callicarpa-microbotrys Rydb. -pubens Michx.:
Eurasia-N. America

VALERIANACEAE

Valeriana capitata Pall.: Arctic Eurasia-arct. -montane W. N. America

COMPOSITAE

Achillea millefolium L. complex, consisting of:

A. millefolium: Eurasia-*A. borealis* Bong. on W. N. America coastal
slope, both n=27, and

A. lanulosa Nutt.: Cascade-Sierras-Atlantic, ssp. alpicola (Rydb.) in
Hall Area.

Antennaria dioica (L.) Gaertn.: Eurasia-Kamtschatka-Aleutian Islands;
rosea Greene-alpina (1) Gaertn.: W. N. America: Alaska-Coast R. -
Rocky Mts.

Solidago virgaurea L.: All Eurasia-multiradiata Ait.: Aleutians-Atlantic (1)

Harvey Monroe Hall Area: North American Species Complexes

Note: The Hall Area entity is underlined.

II. PACIFIC COASTAL COMPLEXES

III. GREAT BASIN-ROCKY
MOUNTAINS COMPLEXES

PTERIDOPHYTAE AND RELATIVES

Cheilanthes gracillima D. C.:
Coast R.-Sierras-B. C. W.
Montana; to 10,200 ft.

(Cf. Circumpolars:)
(*Cryptogramma crispa-acrostichoides*)

(*Cystopteris fragilis*)
(*Phegopteris alpestris-americanum*)
(*Pteridium aquilinum*)
(*Botrychium simplex-lunaria*)
(*Woodsia alpina-scopulina*)

Adiantum pedatum L.: Coast R.-
Sierras-Alaska-Utah-Quebec:
to 11,000 ft.

Cheilanthes siliquosa Max.
(= *Onychium densum* Brack.)
Coast R.-Sierras-B. C.-Montana-
Quebec: to 11,000 ft.

Pellaea breweri D. C.: Sierras-
Siskiyou-Idaho-Wyoming-Utah:
7000-12,000 ft.

P. bridgesii Hook.: Tulare-Sierra Co.-
Idaho: 6000-11,000 ft.

Isoetes bolanderi Engelm.: San
Bernardino-Sierras-Washington-
Arizona: 5000-11,000 ft.

Selaginella watsonii Underw.: San
Jacinto-Sierras-White Mts.-
Arizona-Oregon-Montana

CONIFERAE

Pinus jeffreyi Vasey: Hall Area: wind spread from
1000 ft. below; old dwarfs, never mature at
10,000-11,000 ft. in Hall Area. Region of the
species: California-Oregon: 6000-9000 ft.

(Cf. Circumpolars:)
(*Juniperus communis*)
(*Tsuga mertensiana-araragi*)
(*Pinus cembra-pumila-albicaulis*)
(*P. silvestris-murrayana*)

SPARGANIACEAE

Sparganium:
(Cf. Circumpolars:)
(*Sparganium angustifolium*)

GRAMINEAE

Agropyron pringlei Hitchc.
California-Tulare-Sierra Cos.:
7500-11,000 ft.

GRAMINEAE

Agropyron:
(Cf. Circumboreal complex:)
(*Agropyron caninum-trachy-*
caulum)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

GRAMINEAE (cont.)

HYBRIDS

Agropyron trachycaulon x

Sitanion hystrix: S. facing slopes,
Hall Area, many sites. Sterile.

Agrop. pringlei x Sitanion hystrix: N.
facing slopes, Hall Area. Sterile.

Agrostis thurberiana Hitchc.:

Coast R. -B. C.-Sierras-Trinity
Co.: 4500-11,000 ft.

Agrostis idahoensis Nash: San Jacinto-
Sierras-Washington-Montana-
N. Mexico: 5000-11,000 ft.

A. scabra Willd. (was A. hiemalis
Willd.): Coast R.-Alaska-
Newfoundland-Florida-Texas-San
Jacinto-Sierras: 3500-10,000 ft.

A. variabilis Rydb.-A. rossae: Sierras-
N. Coast R.-B. C.-Alberta-Colorado:
5000-12,000 ft.

Bromus suksdorfii Vasey: Sierras-
Coast R.-Washington: 4000-
11,000 ft.

Bromus marginatus Nees: Coast R.-
Sierras-B. C.-S. Dakota: below
11,000 ft.

Calamagrostis breweri Thurb.:
Sierras-Trinity Co.: 6200-12,000 ft.

Calamagrostis inexpansa Gray:
Sierras-Siskiyou Co.-Alaska-Maine-
Virginia-N. Mexico: 4500-11,000 ft.
(Member circumpolar complex)

(Cf. Circumboreal complexes:)

(C. purpurea-canadensis)

(Festuca ovina)

(Koeleria cristata)

(Phleum alpinum)

(Deschampsia caespitosa)

(Hordeum nodosum-brachyanthera)

C. purpurascens R. Br. Alaska-
Quebec-Colorado-Sierras-White Mts.-
Siskiyou: 9500-13,000 ft.

Danthonia intermedia Vasey: Sierras-
N. Coast R.-Alaska-Newfoundland-
Michigan-N. Mexico: 5200-11,000 ft.

D. unispicata Munro: Sierras-N. Coast
R.-B. C.-Montana-Colorado: 4500-
11,000 ft.

Deschampsia elongata (Hook.)
Munro: Coast R.-Sierras-Alaska-
Wyoming-Arizona-Mexico-Chile:
4500-10,100 ft.

Puccinellia (Glyceria) erecta (Hitchc.)
Munz.: Sierras-Trinity Co.-Crater
L.-Nevada: 9000-11,000 ft.

Puccinellia (Glyceria) pauciflora (Presl.)
Munz.: Coast R.-Sierras-Alaska-
S. Dakota-N. Mexico: to 10,000 ft.
Melica bulbosa Geyer: Sierras-Humboldt
Co.-B. C.-Colorado-Texas: 7000-
11,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

GRAMINEAE (cont.)

- Poa* *hanseni* Scribn. (= *P. leibergii* Scribn. ?): Tulare Co. -Sierras-Eldorado Co.: 7000-11,000 ft. (=alpine form of *P. pringlei* Scribn.).
- (Cf. Circumboreal complex:)
(*Poa pratensis*-*alpigena*-*arctica*)
- Sitanion* *hystrix* J. G. Sm.: California Coast R. -B. C.
- Oryzopsis* (*Stipa*) *kingii* (Boland) Beal: Sierras-Tulare-Mono Cos.: 9300-11,500 ft.
- Melica* *stricta* Bol.: San Bernardino-Sierras-Oregon-Utah: 4000-11,000 ft.
- Muhlenbergia* *andina* (Nutt.) Hitchc.: San Bernardino-Panamint-Sierras-Modoc Co. -Atlantic Coast: 6000-10,000 ft.
- Muhlb.* *filiformis* (Thurb.) Rydb.: San Jacinto-Sierras-B. C. -S. Dakota-N. Mexico: 5000-11,000 ft.
- Muhlb.* *montana* (Nutt.) Hitchc.: Sierras-Trinity Co. -Montana-Texas-Mexico: 4500-10,000 ft.
- Muhlb.* *richardsonii* (Trin.) Rydb. (= *M. squarrosa* Rydb.): San Bernardino-Sierras-Modoc Co. -Atlantic Coast: 5000-11,000 ft.
- Poa* *canbyi* (Scribn.) Piper: Sierras-Washington-B. C. -Saskatchewan-Idaho-Colorado: 5000-10,500 ft. (= *P. sandbergii* Munz et Keck p.p.)
- P.* *epilis* Scribn.: Sierras-B. C. -Alberta-Colorado: 5000-10,500 ft.
- P.* *gracillima* Vasey: Sierras-Trinity-Siskiyou Cos. -B. C. -Alberta-Rocky Mts.: 6000-12,200 ft.
- P.* *nervosa* (Hook.) Vasey.: San Bernardino-Sierras-Modoc-Siskiyou Cos. -B. C. -Rocky Mts.: 6000-12,500 ft.; apmct, ♀♀ : 2n=63-91; Washington coastal, sexual; 2n=28 (Grun, 1955) (12)
- (*) *P.* *rupicola* Nash: Sierras-Tulare-Mono Cos. -White Mts. -Rocky Mts. -Alberta-N. Mexico; alpine: 11,000-13,000 ft.
- Sitanion* *hystrix* (Nutt.) J. G. Sm.: Sierras-S. Dakota-Missouri-Texas-Sea level-10,500 ft.; hybridizes with two *Agropyron* spp.
- Stipa* *columbiana* Macoun: Sierras-Siskiyou-Alaska-S. Dakota-Texas: 4000-10,500 ft.
- S.* *lettermannii* Vasey, n=16: awns glabrate, geniculate: San Bernardino-Sierras-Modoc Co. -Montana-N. Mexico: 5000-11,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

GRAMINEAE (cont.)

Stipa californica Merr. et Davy,
n=18: Sierras-Trinity-Siskiyou
Cos.: 4500-10,400 ft. Acc. to
Lenn. Johnson mainly W. slope
of Sierras
(Cf. Circumboreal:)
(*Trisetum spicatum*)

Stipa occidentalis Thurb., n=18:
San Jacinto-Sierras-Panamint-
Washington-Arizona

S. nevadensis Lenn. Johnson, n=34.
Local amphiploid of *S. letterman-*
nii x *occidentalis*. Awn twice
geniculate, long awn hairs.
S. pinetorum Jones, n=16: E. slope
of Sierras-White Mts. - Panamint-
Idaho-Montana-Colorado: 7000-
12,500 ft.

CYPERACEAE

CYPERACEAE

(Arranged in Natural Groups)

Filifoliae Carex

Carex excerta Mke.: "Short Hair":
San Bernardino-Sierras-Lassen C. -
S. Oregon-W. Nevada: 5000-
12,000 ft.
C. breweri Scott: Sierras-Mts.
Lassen-Shasta-Eddy-Washington:
7700-12,399 ft.

Bicolores Carex

Carex aurea Nutt.: California
Coast R.-Sierras-B. C. -
Atlantic: 3500-10,900 ft.

Foetidae

C. vernacula Bailey: Sierras-
Modoc Co. - Mt. Lassen-White
Mts. - Nevada-Washington-Rocky
Mts.: 6000-12,300 ft.
C. nigricans C. A. Mey.: Sierras-
Mts. Lassen-Shasta-N. Coast R. -
Alaska-Alberta-Colorado: 7500-
12,000 ft.
C. subnigricans Stacey: Sierras-
White-Sweetwater Mts. - Nevada-
Oregon-Idaho-Utah: 8500-
12,500 ft.

Ovales

Carex abrupta Mke.: S. California
Mts. - N. Coast Prairie-Sierras-
Modoc Co. - Mt. Lassen-Oregon-
Nevada-Sweetwater-Panamint Mts.:
Sea Level-11,500 ft.

Ovales

Carex illota Bailey: San Bernardino-
Sierras-Mt. Lassen-Modoc Co. -
Oregon-Rocky Mts.: 7000-
11,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

CYPERACEAE, (cont.)

Ovales(cont.)

Carex mariposana Bailey: S.
California Mts.-Sierras-Washoe
Co.-Nevada: 4000-11,400 ft.

(Cf. Circumpolar complexes:)
(Carex macloviana-festivella)
(C. canescens)
(C. capitata)
(Heleocharis pauciflorum)

Ovales (cont.)

Carex straminiformis Bailey:
Sierras-Modoc Co.-Mts. Lassen-
Shasta-Washington-Montana-
Utah: 6500-12,500 ft.
C. subfusca Boot.: Coast R., Lower
California-Sierras-Panamints-
Lassen-Shasta-B. C.-Nevada-
Arizona: 1000-11,500 ft.
C. multicostata Mkze.: Sierras-
Mts. Lassen-Shasta-N. Coast
R.-Oregon-Nevada-Idaho: 5000-
11,400 ft.
C. phaeocephala Piper: Sierras-
White-Sweetwater Mts.-Lassen-
Shasta-B. C.-Rocky Mts.: 9000-
12,800 ft.
C. praticola Rydb.: Coastal
prairies, Humboldt Co.-Alaska-
Yukon-Manitoba-Gaspe Peninsula-
Greenland (type local)-Idaho-
Utah-Colorado: Summit,
Conness Mts.-White Mts., Hall
Area. Sea level-12,000 ft. Carl
Sharsm. says ours is C. hayden-
iana (below)
C. haydeniana Olney (= C. nubicola
Mkze.?): Sierras-Warner Mts.-
Oregon-Rocky Mts.: 8000-
13,000 ft.

Montanae

Carex brevipes W. Boot.: Sierras-
Tehama Co.-California N.
Coast R.-Washington-Idaho-
Nevada: 2400-12,300 ft.
C. fissuricola Mkze.: Sierras-
Mt. Shasta-Nevada-Utah: 5000-
11,500 ft.
C. spectabilis Dewey: Sierras-
Mts. Lassen-Shasta-Nevada-
Utah: 5800-12,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

CYPERACEAE (cont.)

Hirtae

- Carex sartwelliana* Olney: San Jacinto Mts.-Sierras-Tuolumne Co.: 4000-8600 ft. ?
C. congdonii Bailey: Sierras to Tuolumne Co. Is this the subalpine-alpine ecotype of preceding?: 8500-12,800 ft.
C. helleri Mke.: Sierras-Tulare-Eldorado Co.-Mt. Lassen-Sweetwater Mts.-E. to Elko Co.-Nevada: 6500-13,600 ft.
 **Scirpus clementis* Jones. Local endemic, high altitude, Kern-Inyo-Mono Cos.: 8000-12,000 ft.
S. criniger Gray (*Eriophorum* spec.) N. Coast R.-Mendocino Co.-S. Oregon-Sierras: 7000-11,500 ft.

Atratae

- Carex raynoldsii* Dewey: Sierras-Modoc Co.-Lassen-Siskiyou Mts.-B. C.-Rocky Mts.: 6000-10,300 ft.
C. heteroneura Boot.: San Jacintos-Sierras-Lassen-Siskiyou-Trinity Co.-Sweetwater-White-Warner Mts.-Nevada-Wyoming: 5000-11,500 ft.

Acutae

- C. scopulorum* Holm: Sierras-Mt. Lassen-Washington-Warner-Sweetwater-Rocky Mts.: 6900-10,600 ft.
C. gymnoclada Holm: Sierras-Coast R.-Glenn-Siskiyou Cos.-Mts. Shasta-Lassen-B. C.-Sweetwater Mts.-Colorado: 5200-11,200 ft.

JUNCACEAE

- Juncus dubius* Engelm.: Sierras-Coast R.-San Diego-Oregon: to 10,200 ft.
 **J. chlorocephalus* Engelm.: Sierras, end. Tuolumne-Nevada-Mono Cos.: 4000-10,200 ft.
 **J. megaspermus* Herm.: Sierras: 3400-10,500 ft. Local endemic

JUNCACEAE

- Juncus nevadensis* Wats.: San Jacinto-Sierras-B. C.-Montana-Wyoming: 4000-10,700 ft.
J. mertensianus Bong.: Sierras-Modoc-N. Coast R.-Alaska-Inyo Co.-Rocky Mts.: 4000-11,500 ft.
J. drummondii E. Mey.: Sierras-Siskiyou-Alaska-Alberta-N. Mexico: 6000-11,600 ft.
J. longistylis Torr.: Sierras N. to B. C.-E. to Nebraska-N. Mexico: 5000-10,000 ft.
J. parryi Engelm.: Sierras-Siskiyou-Trinity Cos.-B. C.-Rocky Mts.: 6000-12,500 ft.
Luzula divaricata Wats.: parviflora complex: San Bernardino-Sierras (Cf. *Luzula* of Circumpolar Group;) (*L. orestera-frigida*) (*L. spicata*) (*L. multiflora* complex)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

LILIACEAE

- Allium campanulatum* Wats.: N. Coast R. to Oregon; Mts. San Diego Co.-Sierras-W. Nevada: 2000-10,200 ft.
- Brodiaea ixioides* (Ait.) Wats. (J. T. Howell lists it as *B. scabra* Greene) Baker var. *analina* (Greene) Munz: In Hall Area: in shade of *Pinus murrayana*; open pine forest, Sierras-Siskiyou Co.: 2000-10,200 ft. Related to *B. lutea* (Lindl.) Mort.
- Lilium parvum* Kell. (= *L. canadense* ssp. *parvum*): Sierras 6500-10,500 ft.; erect flowers (*L. kelleyanum* Lemm. differs by having nodding flowers): Sierras-Siskiyou-Trinity-Inyo-Mono Cos. It is possibly conspecific.

III. GREAT BASIN-ROCKY MTS.

LILIACEAE

- Allium atrorubens* Wats.: E. side of Sierras-Inyo-Mono Cos.-Death Valley: 5000-10,200 ft.
- A. parvum* Kell. (of *A. triacetatum* Torr. complex): Mono-Siskiyou-Modoc Cos.-Oregon-Idaho-Montana: 4500-11,000 ft.
- A. validum* Wats.: Sierras-B. C.-Idaho-California Coast R.: 4000-11,000 ft.
- Calochortus leichtlinii* Hook. (= *C. nuttallii* Torr. var. *subalpinus*): Sierras-Lassen Co.-Panamints-Inyo-Modoc Co.-Oregon-Montana-Nevada-S. California Coast R.: 4000-11,000 ft.
- Fritillaria atropurpurea* Nutt.: Sierras-Siskiyou-Trinity Cos.-Oregon-N. Dakota-N. Mexico: 6000-10,500 ft. (*F. pinetorum* Davidss. is probably the same spec.)
- Smilacina stellata* (L.) Desf.: San Jacinto-Sierras-B. C.-Atlantic Coast. var. *sessilifolia* in Coast R.-Santa Barbara-B. C.-Montana: 4000-11,000 ft.
- (*Veratrum californicum* Durand, see under the circumboreal *V. album* L. complex: Coast R.-Sierras-Washington-Rocky Mts. To 11,300 ft. in Hall Area.)

IRIDACEAE

- Iris missouriensis* Nutt. San Diego Co.-Sierras-Modoc Co.-Mendocino-B. C.-S. Dakota-Along E. edge Hall Area: 3000-11,000 ft.
- Sisyrinchium bellum* Wats.-*idahoensis* (1) Bickn. complex: Lower California-Sierras-Siskiyou Co.-Washington-Idaho-Lower California-Death Valley: to 10,800 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

ORCHIDACEAE

(cf. I. Circumboreal Complexes)

Habenaria dilatata-leucostachys
(Lindl.): N. America-N. E.
Asia-W. Europe

H. hyperborea (L.) Rich. Br.: N.
America-Greenland-Europe-
Iceland

H. sparsiflora Wats. W. N.
America: 4000-11,000 ft.;
fairly clear species

Spiranthes romanzoffiana C. et S.:
Entire N. America-Alaska-
Hudson Bay-California-Sierras-
Coast R.
Europe: Ireland-Scotland:
Montane-10,000 ft.

SALICACEAE

Salix eastwoodiae Cockerall:
Sierras-Tulare-Modoc-
Washington: 7000-10,600 ft.
S. jepsonii Schneid.: Sierras-
Tulare-Tehama-Humboldt-
Trinity-Siskiyou Cos.: 5500-
10,000 ft.

SALICACEAE

Salix nivalis Hook.: Sierras: only
Mono Co.-B. C.-Idaho-Utah-
Colorado: 10,000-12,000 ft.
(Cf. Circumpolar complexes):
(*Populus tremula-tremuloides*)
(*Salix arctica-anglorum-petrophila*)
(*S. reticulata*)
(*S. phylicifolia-monica*)
(*S. glauca-orestera*)

FAGACEAE

Castanopsis sempervirens (Kell.)
Dudley: Hall Area, one crawling
specimen: San Jacinto-Sierras;
Coast R. from Lake Co.-Oregon:
2500-11,000 ft.

URTICACEAE

Urtica holosericea (Nutt.) Blume:
Sierras-Oregon-Washington-
Idaho-N. Mexico: Sea level-
10,600 ft.

POLYGONACEAE

Eriogonum latifolium Sm. ssp.
nudum Dougl. ex Benth.: San
Jacinto-Coast R.-Sierras-
Washington-Cuyamaca Mts.-
Nevada; 9 subspp.: Sea level-
12,000 ft.

POLYGONACEAE

Eriogonum ovalifolium Nutt.:
Sierras-Tulare Co.-B. C.-
Montana-Wyoming for the species:
5000-12,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

POLYGONACEAE (cont.)

Eriogonum marifolium T. et G. -
incanum T. et G.: Sierras-Tulare
Co.-central Oregon-W. Nevada:
3500-12,700 ft.

**E. lobbiai* T. et G.: Sierras-Inyo-
Mariposa-Plumas Cos.: 5500-
12,000 ft.

E. spergulinum Gray: Sierras-
Tulare-N. Oregon-Idaho-California
Coast R.-Ventura-Lake Co.:
5000-11,500 ft.

Polygonum shastense Brew.: Sierras-
Siskiyou Co.-Oregon: 7000-
11,000 ft.
(Cf. strictly coastal *P. paronychia*
C. et S.; Monterey-B. C.)

(Cf. Circumpolar complexes:)
(*Oxyria digyna*)
(*Polygonum viviparum*-*bistortoides*)
(*Rumex acetosa*-*paucifolius*)

Polygonum minimum Wats.:
California Coast R.-Sierras-
Tulare-B. C.-Rocky Mts.:
5000-11,200 ft.

P. douglasii Greene-*latifolium*
Greene: San Diego-Coast R.-
Sierras-Tulare-B. C.-Quebec-
Rocky Mts.; three vars.: 4500-
10,500 ft.

P. kelloggii Greene var. *watsonii*
Sm.: California Coast R.-San
Bernardino Mts.-Sierras-
Washington-Colorado: 4500-
11,500 ft.

CHENOPODIACEAE

Chenopodium atrovirens Rydb.:
Sierras-E. slope-Mohave-E.
Oregon-Rocky Mts.: 4000-
11,000 ft. Annual.

PORTULACACEAE

**Claytonia nevadensis* Wats.:
Tuolumne-Mono Cos.: 8000-
12,000 ft.

**Lewisia sierrae* Ferris: Tulare-
Mono Cos.: 9100-13,500 ft.

Calyptridium umbellatum (Torr.)
Green var. *caudiciferum* (Gray)
Jeps. (=Spraguea u. var. c. Gray):
Species: Coast R.-Sierras-B. C.-
Rocky Mts. Var.: gravel and
cinders; Sierras-Washington:
10,000-11,000 ft.

PORTULACACEAE

Lewisia pygmaea (Gray) Rob.: San
Bernardino Mts.-Sierras-
Washington-Montana-N. Mexico:
9000-12,250 ft.

L. triphylla (Wats.) Robs.: Sierras-
Siskiyou Co.-Washington-Rocky
Mts.: 4900-10,700 ft.

L. nevadensis (Gray) Robs.: San
Bernardino-Sierras-Modoc Co.-
N. Coast R.-Washington-Rocky
Mts.: 4500-12,000 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

PORTULACACEAE (cont.)

- Montia chamissoi* (Ledeb.) Dur.:
San Diego-Sierras-Modoc-Lake
Co.-Alaska-Montana-N. Mexico-
San Bernardino: 4000-11,000 ft.
M. linearis (Dougl.) Greene.:
Sierras-Modoc-Coast R.-B. C.-
Montana: At 10,200 ft. Annual.

CARYOPHYLLACEAE

- **Silene sargentii* Wats. (=S.
watsonii Robs.): Sierras-W.
Nevada: 6500-12,000 ft.
Stellaria crispa C. et S. (=S.
borealis Bigel.; =Alpine *crispa*
(Holz): Coast R.-San Jacintos-
Sierras-Alaska: Coast-11,000 ft.)

(Cf. Circumpolar complexes:)
(*Sagina linnaei*)
(*Stellaria crispa-media*)

RANUNCULACEAE

- Aquilegia pubescens* Cov.: whitish
flower, long straight spur; alpine
fell fields: Sierras-Tulare-Inyo-
Mono Cos.: 10,200-12,000 ft. (11)
A. formosa x *A. pubescens* frequent
in the border zone; parental
characters introgress (11).

CARYOPHYLLACEAE

- Arenaria formosa* Fisch. (=A.
capillaris California authors,
not Poirr.): High peaks Sierras-
Cascades-Nevada-Oregon-Mono
Co. Correct in Peck Flora.
Woody caudex, slender stems:
6000-11,000 ft.
A. obtusiloba (Rydb.) Fern.: Low
cespitose cushion plants. Alpine,
to 11,300 ft. Alpine fell fields,
10,500-12,500 ft.: Sierras-
Alaska-Rocky Mts.
A. nuttallii Pax: Talus scree plant;
rope-like stems deeply in scree.
11,300 ft.

RANUNCULACEAE

- Aconitum columbianum* Nutt.:
Sierras-Modoc-Trinity-Oregon-
B. C.-Rocky Mts.: 4000-10,500
ft.
Aquilegia formosa Fisch. var.
pauciflora (Greene) Boot.:
Moist woods: San Bernardino-
Sierras-Modoc-Del Norte-
Siskiyou-Alaska-Montana-Alberta-
Utah: 5000-11,000 ft. (11).
Related to *A. canadensis*.
Delphinium glaucum Wats. (=scopu-
lorum var., g. Gray): in moist,
subalpine stream-beds; thick,
semi-woody rootstock: San
Bernardino-Sierras-Mono-
Siskiyou-Alaska-Rocky Mts.:
5000-10,600 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

RANUNCULACEAE (cont.)

Ranunculus eschscholtzii Schlecht.
var. oxynotus (Gray) Jeps.:
Branched caudex, a snow bank
plant: Var. oxynotus: San
Jacinto-Sierras-Modoc-Sweetwater-
White Mts.: 9000-13,000 ft. The
species: Kamtschatka-Alaska-
Rocky Mts.

Ranunculus alismaefolius Geyer
var. alismellus Gray., roots
tuberous: L. California-San
Bernardino-Sierras-N. Coast R.-
Washington-Montana: 4500-
12,000 ft.

Thalictrum fendleri Engelm. (1):
Sierras-Modoc-Coast R.-Lower
California-Oregon-Montana-
Wyoming-Texas: 4000-10,000
ft. Several chromos. nos. (T.
alpinum L., possibly related:
circumpolar: Eurasia-Mono-
Inyo-White Mts.-Rocky Mts.-
Arctic N. America: 10,500-
12,000 ft.

FUMARIACEAE

(*)*Dicentra uniflora* Kell.: Sierras-
Fresno-Washington-Utah: Alpine
fell fields: 5400-12,000 ft.

CRUCIFERAE

Arabis platysperma Gray-var.
howellii (Wats.) Jeps.: Trinity-
Siskiyou Mts.-San Jacinto-
Sierras-Shasta-Oregon-Nevada:
5000-12,000 ft. var. 10,000-
12,000 ft.

CRUCIFERAE

Arabis divaricarpa A. Nels.:
Sierras-Siskiyou-Trinity Cos.-
Alaska-Yukon-Athabaska-
Gaspé Peninsula-Rocky Mts.:
7000-11,000 ft.

A. drummondii Gray.: Sierras-
Tulare-Inyo Cos.-B. C.-Yukon-
Mackenzie-Athabaska-
Newfoundland-N. Dakota-N.
Mexico-Arizona: 5500-11,000 ft.

A. holboellii Hornem.-ssp.
retrofracta Rydb.: Coast R.-
Sierras-B. C.-Montana-Alaska-
New Brunswick-Greenland:
6000-11,000 ft.

A. lemmonii Wats.: Sierras-
Lassen-Modoc-B. C.-Montana-
Colorado-Utah: 8000-11,000 ft.

HALL AREA, North American Species Complexes

II. PÁCIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

CRUCIFERAE (cont.)

- Arabis lyallii* Wats.: Sierras-Tulare-Inyo-Modoc Cos.-B. C.-Montana: 8000-12,000 ft.
- Barbarea orthoceras* Ledeb.: Montane California-Alaska-N. E. Asia-Baikalia-Mongolia-Manchuria-Sachalin; N. America: Great Slave Lakes-Labrador-Maine-Great Lakes-Colorado-Arizona: 2500-11,000 ft. (B. vulgaris R. Br.-stricta Anderss. are the European counterparts.)
- Descurainia* (*Sisymbrium*) *californica* (Gray) Schultz.: Sierras-Mono-Nevada Cos.-White-Providence Mts.-Mohave-N. Mexico-Oregon-Wyoming: 7000-11,000 ft. (D. pinnata (Walt.) Britt. is close relative below 8000 ft.)
- **Draba breweri* Wats.: White flowers: Sierras-Tulare-Mt. Shasta: 8000-11,500 ft.
- **D. lemmonii* Wats.: Sierras-Tulare-Mono Cos.; yellow flowers, twisted pods, common cushion plant: 8500-13,000 ft.
- **D. oligosperma* Hook. ssp. *subsessilis* (Wats.) Schultz.: E. ridge, White Mts.: 11,000 ft.
- **D. sierrae* Sharsm.: Similar to *D. breweri*, but yellow flowers: E. slope, Sierras-Inyo-Mono: 11,000-12,500 ft.
- Erysimum perenne* (Wats.) Abrams: Sierras-Tulare-Mt. Shasta-Scott-Yolla Bolly Mts.: 7000-12,000 ft. (E. cheiranthoides L. is circumpolar.)
- Draba densifolia* Nutt.: Sierras-Fresno-Modoc Cos.-Washington-Alberta-Wyoming-Idaho-Alaska-Asia: Anadyr. R., Siberia: 8500-13,000 ft.
- D. oligosperma* Hook.; flowers golden, fading white, cushion plant: Sierras-Inyo-Eldorado Cos.-B. C.-Alaska-Yukon-Utah: 11,000-13,000 ft. (Relative of *D. alpina* L., circumpolar, but not at Hall Area.)
- D. stenoloba* Ledeb. var. *nana* (Schultz) (=D. nitida var. *nana*). Annual, yellow flowers: Sierras-Tulare-Modoc Cos.-White Mts.-B. C.-Alberta-Colorado: 7000-12,000 ft.
- Rorippa curvisiliqua* (Hook.) Bess. Annual, vernal pools: Montana-California-B. C.-Wyoming-Lower California-Alkali flats: 6000-10,500 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

CRUCIFERAE (cont.)

Streptanthus tortuosus Kell. var.
orbiculatus (Hall) Jeps.: Sierras-
 Mt. Shasta-Humboldt Co.-S.
 Oregon: Spec.: 1000-11,100 ft.;
 Var.: 7000-11,500 ft.

CRASSULACEAE

Sedum obtusatum Gray: Sierras-
 Tulare-Plumas Co.-W. Nevada:
 S. facing slopes: 5000-13,000 ft.
 (S. *spatulifolium* Hook. is lower
 altitude counterpart, below 7500 ft.
 n=15 in both.)

CRASSULACEAE

(*Sedum rosea* Rhodiola r. -
integrifolium: see Circumpolars)
Sedum lanceolata Torr.: Sierras-
 Tulare-Modoc-B. C.-
 Saskatchewan-Alberta-Nebraska-
 N. Mexico N. facing slopes;
 6000-12,000 ft.
 (S. *stenopetalum* Pursh., 4500-
 5500 ft., is lower altitude
 counterpart; Lassen-Modoc-
 B. C.-Idaho)

SAXIFRAGACEAE

(*Heuchera micrantha* Dougl.)
 (=the lower altitude counterpart
 of *H. rubescens*; Coast R.-
 Sierras; to 7000 ft.)

SAXIFRAGACEAE

Heuchera rubescens T. et G. ssp.
alpicola Jeps.: Sierras-Fresno-
 Placer-Plumas Cos.; Panamint-
 New York-Clark-White Mts.;
 Nevada-Utah: 6000-11,900 ft.
Mitella breweri Gary: Sierras-
 Tulare Co.-B. C.-Montana-
 Idaho-Alberta: 6000-11,500 ft.

Lithophragma bulbifera Rydb.:
 San Bernardino Mts.-Sierras-
 California Coast R.-Trinity-
 Washington: 4500-11,000 ft.

**Saxifraga bryophora* Gray: Sierras-
 Tulare-Plumas Cos.: 7000-
 11,200 ft.

S. *nidifica* Greene: Sierras-Fresno-
 Tuolumne-Mono Cos.; Coast R.-
 Lake Co.-N. Oregon: 2500-
 11,000 ft.

S. *tolmiei* T. et G.: Sierras-Tulare-
 N. Coast R.-N. Olympic
 Peninsula-Vancouver Island-
 Alaska: 8500-11,500 ft.

Saxifraga punctata L. ssp. (Don)
 Hult.: San Bernardino-Sierras-
 Yolla Bolly Mts.-B. C.-Montana-
 N. Mexico: 6500-11,200 ft.

(S. *rivularis* L. *debilis* Engelm:
 see Circumpolars)

(S. *nivalis* L. *aprica* Greene: see
 Circumpolars)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

SAXIFRAGACEAE (cont.)

- Ribes montigenum* Kell.: San Jacinto-Sierras-Modoc-B. C. - Montana-N. Mexico: 5000-12,600 ft.
R. cereum Dougl.: San Jacintos-Sierras-Modoc-B. C. - Montana-Utah-N. Mexico: 5000-12,600 ft.

ROSACEAE

- **Ivesia lycopodioides* Gray: Sierras-White Mts.; ssp. *megalopectala* (Rydb.) Keck. both taxa within Area 10,000-12,000 ft.
 **I. muirii* Gray: Sierras-Fresno-Mono Cos.: High altitude: 9500-12,000 ft.
I. muirii x *I. lycopodioides*: West peak, White Mts.: 12,000 ft.
Potentilla breweri Wats.: Sierras (1) Inyo-Modoc-Siskiyou Cos. - Oregon: 4500-12,000 ft.
P. flabellifolia Hook.: Sierras-Tulare-Shasta-Siskiyou-Trinity Cos.: 5800-12,000 ft.

P. drummondii Lehm. ssp. *bruceae* (Rydb.) Keck; Species: Sierras-Tulare-Modoc-Siskiyou-Lake-B. C.: 6000-11,500 ft. Subspecies, more eastern: Tulare-Inyo Cos. - Sweetwater-White Mts.: 7000-13,000 ft. (1)

(Cf. Circumpolar Rosaceae:)
 (*Geum macrophyllum*-*aleppicum*)
 (*Potentilla fruticosa* complex)
 (*P. glandulosa*-*rupestris* complex)
 (*Sibbaldia* [*Potentilla*] *procumbens*)

ROSACEAE

- Holodiscus discolor* (Pursh.) *Maxim-boursieri* (Carr.) Rehd.: Coast R. - Sierras-B. C. - Montana-Colorado-Arizona-Mohave-White Mts.; Sea level-11,000 ft.
Horkelia fusca Lindl. ssp. *parviflora* (1) (Nutt.) Keck: Sierras-Siskiyou-Del Norte-Oregon-Washington-Wyoming-Nevada: Sea level-10,500 ft.
 (*) *Potentilla diversifolia* Lehm.: (1) Sierras-Tulare-Inyo-B. C. - S. Dakota-Colorado-Arizona: 8000-11,000 ft.
P. gracilis Dougl. - *nuttallii* (Lehm.) Keck: San Diego Co. - Sierras-Alaska-Alberta-S. Dakota-Rocky Mts.; also California N. Coast R.: 2500-11,000 ft.
P. pseudosericea (Rydb.) Keck: High altitude: Sierras-Inyo-Mono-Tuolumne Cos. - White Mts. - Wyoming-Colorado: 10,500-13,000 ft.
Purshia tridentata D. C.: E. slope, Sierras-Tulare-Inyo-Modoc Cos. - Coast R. - Lake-Siskiyou-Trinity-B. C. - Montana-N. Mexico: 3000-11,000 ft.
Rosa woodsii Lindl. var. *ultramontana* (Wats.) Jeps.: E. slope, Sierras-Modoc-Shasta-B. C. - Montana-San Bernardino Mts.: 3500-11,000 ft.

HALI AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

ROSACEAE (cont.)

(*Sorbus scopulina-aucuparia* complex)

Spiraea densiflora Nutt. ssp.
splendens (Baum) Abrams:
Sierras-Tulare-Siskiyou-B. C. -
Wyoming-Montana: 5000-
11,000 ft.

LEGUMINOSAE

LEGUMINOSAE

Lupinus lyallii Gray var. danaus
(Gray) Wats.: Species: erect,
blue-flowered: 8000-10,500 ft.:
S. Sierras-Washington-W. Nevada
var. danaeus: alpine, prostrate,
dwarf, whitish flowers, as one
ascends: 10,500-13,000 ft.;
alpine Sierras-Northward-Warner
Mts.

L. polyphyllus Lindl. ssp. superbus
(Hell.) Munz. Species: Coastal
strand-San Jacintos-Sierras-B. C.
Ssp. superbus: Sierras-Tulare-
Siskiyou-Modoc-W. Nevada:
4000-10,500 ft.

**Trifolium monanthum* Gray: horiz.
slender-stemmed, creeping:
Sierras: 6000-11,000 ft.

T. multicaule M. E. Jones: erect,
semi-woody stems; (some consider
it a var. of *T. monanthum*):
10,500 ft.

T. oliganthum Steud.; annual, low,
slender; gravel bed, E. flank of
Mt. Conness, at 10,500 ft. limit
3500 ft. previously considered

(*)*Astragalus kentrophyta* Gray var.
danaus Barn.: Detachable,
single-seeded, white-woolly pods;
Sierras-Fresno-Mono-White-
Sweetwater Mts.-Montana-
Colorado-N. Mexico; exposed
E. slopes, high fell fields: 9000-
12,000 ft.

A. lentiginosus Dougl. var. ineptus
(Gray) Jones; one of 17 vars.:
E. slope, Sierras-Inyo-Alpine
Co.: 7000-12,000 ft. for var.;
Species: Coast R.-Siskiyou-
Lassen-Mt. Hamilton-Santa
Barbara-San Bernardino-
Riverside-White Mts.-Mohave-
Arizona-Charleston Pk.-
Colorado-Oregon-Montana

A. purshii Dougl. var. lectulus
(Wats.) Jones: White Mts.-
Mono-Modoc-Siskiyou Cos.-
Nevada-Washington for this var.
Species: N. Coast R.-B. C.-
Alberta-Washington-Nevada-
Colorado

(LINACEAE)

HYPERICACEAE

(*Linum perenne lewisii*: see
Circumpolar plants)

(CALLITRICHACEAE)

Hypericum anagaloides C. et S.:
Coastal marshes: Sierras-Lower
California-B. C.-Idaho-Montana:
A delicate, moss-like alpine form:
4000-10,500 ft.

(*Callitriche verna-palustris*:
see Circumpolar plants)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

VIOLACEAE

Viola macloskeyi Lloyd: N. Coast
R.-B. C.-San Jacintos-Sierras-
3500-11,000 ft.: Moist spots

ONAGRACEAE

Epilobium glaberrimum Barbey:
N. Coast R.-San Jacinto-Sierras-
W. Nevada-Washington

(Cf. Circumpolar complexes:)
(*Epilobium angustifolium*)
(*E. latifolium*)
(*E. anagallidifolium-alpinum*)

UMBELLIFERAE

**Podistera nevadensis* (Gray)
Wats.: Fell fields.: San Bernardino-
Sierras-Placer-Mono-White Mts.:
10,000-13,000 ft. Low alpine
cushion plant, white flowers.
Pteryxia terebinthina (Hook.)
Coul. et Rose (=Cymopteris t.
californica Jeps.): N. Coast R.-
Sierras-Siskiyou-Sweetwater Mts.:
7000-10,800 ft.; petal yellow,
dissected leaves.

III. GREAT BASIN-ROCKY MTS.

VIOLACEAE

Viola purpurea Kell: 3000-11,000 ft.
10 subspecies, California-
Oregon-Nevada-Utah-Washington-
Wyoming (5)
ssp. *mesophyta* M. S. Baker et
Cl.: S. slopes, Hall Area:
10,500 ft.
ssp. *xerophyta* Baker et Cl.:
E. facing gravel terrace,
10,300 ft., Hall Area.
ssp. *atriplicifolia* (Greene)
10,000 ft., ground floor,
Slate Creek Valley, Hall Area.

ONAGRACEAE

(*)*Epilobium obcordatum* Gray: High
Sierras-Tulare-Modoc Co.-E.
Oregon-Idaho: 10,500-13,000 ft.
Gayophytum racemosum T. et G.
var. *caesium* (T. et G.) Munz:
San Bernardino-Sierras-Modoc
Co.-Washington-Rocky Mts.:
5000-11,000 ft.
G. humile Juss.: Coast R.-Sierras-
Washington-Idaho-Chile: 3000-
10,000 ft.

UMBELLIFERAE

Ligusticum grayii C. et R.:
Sierras-Washington-Montana:
4000-10,800 ft.; (white petals)
Perideridia (Carum) *gairdneri*
(H. et A.) Mathias.: San Diego
Co.-Sierras-B. C.-Alberta-N.
Mexico. Many plant communities;
white flowers, round corm.
Lowland-11,000 ft.
Sphenosciadium capitellatum
C. et R.: San Jacintos-Sierras-
White Mts.: 3000-10,500 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

ERICACEAE

Arctostaphylos nevadensis Gray:
Sierras-Tulare Co.-Northward-
Washington-California Coast R.-
Lake Co.: 5000-10,200 ft.
(Cf. Circumpolars: Cassiope-Ledum)
(Phyllodoce-Pyrola minor-secunda)

*Vaccinium nivictum Camp (=V.
caespitosum Michx.): Sierras-
Tulare-north to Mt. Shasta: 7000-
12,000 ft.

PRIMULACEAE

Dodecatheon alpinum Greene:
Essentially Pacific slope: San
Jacinto-Sierras-Ventura-Lake-
Humboldt-Oregon-Utah-Arizona:
8800-12,000 ft. (1)
(Close relative: jeffreyi Van Hout.
is taller but at lower altitude, 4000-
9000 ft. It reaches Alaska.) (1)

*Primula suffrutescens Gray: Sierras-
Siskiyou-Trinity Cos.: 8000-
13,500 ft.; on Mt. Conness.

GENTIANACEAE

Gentiana newberryi (Gray) Greene:
perennial, white flowers; Sierras-
Siskiyou-White Mts.: 7000-
12,000 ft.

(Cf. Circumpolars:)
(G. detonsa-holopetala-simplex
complex)
(G. amarella complex)

III. GREAT BASIN-ROCKY MTS.

ERICACEAE

Gaultheria humifusa (Grah.) H. M.
Hall: Sierras-Tulare-Mono-
B. C.-Rocky Mts.: 8000-
10,500 ft.

Kalmia polifolia (Wang) var.
microphylla (Hook.) Rehder:
Coast R.-Humboldt Co.-Sierras;
north to Alaska-Rocky Mts.:
7000-12,000 ft.

Vaccinium occidentale Gray:
Sierras-Tulare-Modoc-Siskiyou-
Trinity-B. C.-Rocky Mts.:
5000-11,000 ft.

APOCYNACEAE

Apocynum androsaemifolium L.:
Hall Area: S. slope, 10,500 ft.:
San Jacinto-Sierras-B. C.-
Alaska-Yukon-Great Slave Lakes-
Hudson Bay-Newfoundland-
Arizona: 5000-10,500 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

POLEMONIACEAE

- Gilia capillaris* Kell.: N. Coast R. -
Mendocino Co. -Sierras-
Washington: 2500-10,500 ft.
- Linanthus ciliatus* (Benth.) Greene
var. *neglectus* (Greene) Jeps.:
the variety goes to 10,400 ft. in
Hall Area: Sierras-San
Bernardino-Coast R. -Siskiyou
Species: below 8000 ft. to Oregon-
Nevada
- L. harknessii* (Curran) Greene:
Coast R. -Lake Co. -Oregon-
Washington-Sierras-Fresno
northward: 3000-10,500 ft.
- **Polemonium eximium* Greene: Type
locality: Mt. Conness in Hall
Area: Sierras-Tulare-Inyo-
Mono-Tuolumne Cos.: 10,000-
14,000 ft.

HYDROPHYLLACEAE

- Nemophila spathulata* Cov.; small
annual: Riverside-Sierras-
Plumas-E. Tehama-W. Nevada:
4000-10,500 ft.

BORAGINACEAE

- **Cryptantha* (*Oreocharya*)
nubigena (Greene) Payson:
Sierras-Tulare-Mono-Tuolumne:
8000-12,500 ft.; Hall Area:
8 sites, including Conness Glacier
Moraine

III. GREAT BASIN-ROCKY MTS.

POLEMONIACEAE

- Leptodactylon pungens* (Torr.) Rydb.
ssp. *pulchriflorum* (Brand)
Mason: San Bernardino-
Sierras-Trinity-Modoc-Inyo-
S. Oregon-Nevada-Washington-
Idaho-Rocky Mts.: ssp. 5000-
12,000 ft.
- Phlox covillei* E. Nels.: San
Bernardino-Sierras-Inyo-Mono-
White Mts.: 6000-12,000 ft.;
dense, short-lived cushions.
(*Ph. covillei*, *Ph. caespitosa*
Nutt. and *Ph. douglassii* Hook.
appear to form a species complex.)
- Polemonium pulcherrimum* Nutt.
(*P. berryi* Eastw.): Sierras-
Mariposa-Mono-Modoc-
Siskiyou-Trinity-B. C. -Alaska-
Yukon-Alberta-Wyoming: 8000-
11,000 ft.
(Close relative: *P. boreale*
Adams: Siberia-N. Europe-
Greenland; they form a
circumpolar complex.)

HYDROPHYLLACEAE

- Phacelia magellanica* Cov. var.
frigida (Greene) Jeps. Prostrate
perennial. Species: Coast R. -
Lake-Mendocino-Trinity-Wyoming-
Utah-S. America
Variety: Sierras-Kern-Lassen-
Shasta-White Mts. -Oregon:
7000-13,000 ft.

BORAGINACEAE

- Cryptantha torreyana* (Gray)
Greene (det. Ivan Johnston):
Sierras-Marin-B. C. -Wyoming-
Utah; Hall Area on S. talus slope,
10,600 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

BORAGINACEAE (cont.)

Hackelia nervosa (Kell.) Johnston:
Sierras-Fresno-Plumas; Hall
Area: S. facing talus: 10,500-
11,000 ft.

Hackelia jessicae (McGreg.) Brand:
Sierras-Tulare-Siskiyou-B. C. -
N. Coast R. -Ontario-N. Mexico;
Hall Area: S. facing talus:
10,300-10,500 ft.

LABIATAE

Monardella odoratissima Benth.
ssp. parvifolia (Greene) Epl.
Species: Lower California-
B. C. -Montana-Colorado-N.
Mexico. This ssp: Sierras-
Tulare-Tuolumne-Mono-S. Rocky
Mts.: 8000-10,500 ft. (1)

SCROPHULARIACEAE

- Castilleja breweri Fern.: Sierras-
Tulare-Inyo-Mono-Eldorado Cos.:
7000-11,000 ft.
*C. culbertsonii Greene: Sierras-
Tulare-Madera-Inyo-Mono Cos.:
8000-11,000 ft.
*C. breweri x C. culbertsonii: Hall
Area: Middle Ridge: 10,400 ft.,
with parents
*C. nana Eastw.: Sierras-Tulare-
Eldorado-Mono-Modoc-White-
Inyo Mts.: 8000-12,000 ft.
*C. peirsonii Eastw.: Sierras-
Fresno-Madera-Inyo-Mono Cos.:
8700-11,000 ft.
Collinsia torreyi Gray ssp. wrightii
Johnston: This ssp.: San
Bernardino Mts.-Sierras-
Siskiyou-Trinity Cos.: 7000-
11,000 ft.
(ssp. torreyi: below 10,000 ft.;
ssp. latifolia: 4000-7000 ft.)
(Mimulus cardinalis Dougl.: lower
altitude counterpart of M. lewisii
Pursh.: Sea level to 6500 ft.
L. California-S. Oregon) (6, 13)

SCROPHULARIACEAE

- Castilleja applegatei Fern. (= C.
pinetorum Fern): Sierras-Modoc-
Tehama-Siskiyou-N. Coast R. -
Mt. Pinos-Panamints-Central
Oregon-Central Idaho-N. W.
Nevada: 2000-11,000 ft.
C. miniata Dougl.: Sierras-Modoc-
B. C. -Alberta-Montana-Colorado-
San Diego Mts. -Coast R. -Glenn-
Siskiyou. To 11,000 ft., Great
Basin floor around Mono L.,
6000 ft.
Mimulus lewisii Pursh.: Sierras-
Tulare-Mono-Siskiyou-Modoc-
B. C. -Alaska-Montana-Colorado:
6000-10,600 ft. (6, 13)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

SCROPHULARIACEAE (cont.)

Mimulus guttatus Fisch: Sea level to 11,000 ft. under various names. N. to Alaska, E. to Rocky Mts., S. to Mexico (4, 13)

M. moniliformis Greene; a non-viscid plant, differing from *M. moschatus* of lower altitude; reminds one of *M. dentatus* Nutt. in Washington Coast R., farther north. Hall Area: on forested S. facing slope at 10,350 ft.

(*M. moschatus* Gray: Coast R.-San Diego-Del Norte-Siskiyou-B. C.-Sierras-Modoc-Montana-Utah-Colorado-Atlantic: below 7500 ft.)

Pedicularis attolens Gray: Sierras-Modoc-Lassen-N. Siskiyou-Oregon-White Mts.: 5000-12,000 ft.

Penstemon davidsonii Greene: Sierras-Tulare-Siskiyou-Modoc-Washington-Nevada: 9000-12,000 ft. (1)

Mimulus tilingii Regel (= *M. corallinus*-*M. implexus* Greene): Alpine counterpart of *M. guttatus*, (4, 13): San Jacinto-Sierras-B. C.-Alaska-Rocky Mts.-Mexico: 6000-10,500 ft.

M. primuloides Benth. var. *pilosellus* (Greene) Smiley: rhizomes, ending in bulblets. The species: Coast R.-Sierras-Glenn-Oregon-Montana-Rocky Mts.: 4000-8000 ft.; the var. to 11,300 ft. in Hall Area.

M. rubellus Gray, a complex of 1-2 cm-high minute annuals, highly variable. In Hall Area, common on S. slopes of 10,200-10,600 ft. Species range: San Jacinto-Sierras-Humboldt-B. C.-Montana-Colorado-N. Mexico-L. California-Mohave-White Mt.-Nevada: 3000-8000 ft.

Following three suspected members of the complex have been collected in Hall Area:

var. *breweri* (Gray) Jeps., glandul glandular: Sierras-Coast R.-Lake-B. C.-Montana: 4000-11,000 ft.

M. montioides Gray: yellow flowers; (S. Sierras-W. Nevada: 3000-8000 ft.)

M. suksdorfii Gray: Sierras-Modoc-Siskiyou-Washington-Montana-Colorado-Arizona: 5000-13,000 ft.

Pedicularis groenlandica Retz. var. *surrecta* (Benth.) Piper: Sierras-Coast R.-Humboldt-Siskiyou-Modoc-Atlantic: 6000-12,000 ft.

Penstemon oreocharis Greene: Sierras-Fresno-Inyo-Glenn-Washington-Idaho: 4000-8100 ft.-10,000 ft. in Hall Area.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

SCROPHULARIACEAE (cont.)

Penstemon newberryi Gray: Coast R.-Sonoma-Lake-Humboldt-Sierras-Tulare-Plumas-White Mts.-Nevada; Hall Area: 5000-11,000 ft. (1)

P. davidsonii x P. newberryi: Hall Area, hybrid swarms, wherever parent species meet. (1, 5)

*P. heterodoxus Gray: Sierras-Tulare-Plumas-White Mts.-Nevada: 8000-12,000 ft.

Penstemon speciosus Dougl.: San Bernardino-Sierras-Modoc-Washington-Idaho: 3500-8000 ft.-11,000 ft. in Hall Area (Gardisky L., Tioga Pk.)

(Cf. Circumpolars:)
(Limosella aquatica)
(Veronica alpina complex)

OROBANCHACEAE

Orobanche uniflora L.: Santa Cruz Mts.-Sierras-B. C.-Idaho: 3000-7000 ft.; Hall Area, above slope garden 10,250 ft.

OROBANCHACEAE

Orobanche fasciculatum Nutt.: California in general-B. C.-Michigan-N. Mexico: 4000-10,650 ft. Hall Area, 10,400-10,600 ft.; on roots of Artemisia ludoviciana.

RUBIACEAE

Galium bifolium Wats.: Sierras-Siskiyou-Coast R.-Humboldt-Trinity-Modoc-Washington-Idaho-Utah: 5000-10,500 ft.

Kelloggia galioides Torr.: San Jacinto-Sierras-Modoc-Lake-Humboldt-Trinity-Washington-Idaho-Utah-Arizona: 3000-9600 ft., 10,400 ft. in Hall Area.

CAPRIFOLIACEAE

(Cf. Circumpolar:)
(Sambucus racemosa: to 10,600 ft. in Hall Area.)

CAPRIFOLIACEAE

Lonicera involucrata (Richs.) Banks: Coast R.-Santa Barbara-Del Norte-Sierras-Tulare-Modoc-Alaska-Hudson Bay-New Brunswick-Quebec-Michigan-Colorado-Mexico. Strand-10,200 ft. One colony in Hall Area (1)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

CAPRIFOLIACEAE (cont.)

(*Symphoricarpos mollis* Nutt. :
Coast R.-L. California, below
4000 ft., possibly low altitude
counterpart of *S. vaccin.*)

Symphoricarpos vaccinoides Rydb.
(=*S. rotundifolius* auth.): Sierras-
Fresno-Modoc-B. C.-Montana-
Colorado: 5000-10,500 ft. (in
Hall Area) (1)

VALERIANACEAE

(Cf. Circumpolar:)
(*Valeriana capitata*)

COMPOSITAE

- (*) *Agoseris alpestris* (Gray) Greene:
(=*Nothocalais alpestris* Gray
Chambers): Sierras-Tulare-
Inyo-Washington: 5200-10,500 ft.
Hall Area: tiny perennial;
continues flowering late August-
September after frost.
- (*) *A. elata* (Nutt.) Greene: Sierras-
Tulare-Inyo-Washington: 5200-
10,500 ft. Hall Area: forested
S. slope.

COMPOSITAE

- Achillea lanulosa* Nutt. ssp.
alpicola (Rydb.) Keck: Hall
Area: on S. facing, open slopes,
to 11,300 ft. This milfoil is a
member of the circumpolar *A.*
millefolium L. complex (1, 3, 5,
6, 14). *A. lanulosa*, n=36
extends about from 3000-11,300
ft. in the Sierras-Cascades-
Rocky Mts. eastward to the
Atlantic, developing ssp.
alpicola at high altitudes.
- (*A. borealis* Bong., n=27, is the
coastal Pacific counterpart of
the Eurasiatic *A. millefolium*,
n=27. Ecologically the three
"species" are highly distinct,
but their hybrids are slightly
fertile.)
- Antennaria alpina* Gaertn.: San
Bernardino-Sierras-Yolla Bolly
Mts.-B. C.-Rocky Mts. Eurasia
at high latitudes: 7600-12,500 ft.
Hall Area: dense mats, meadow
bottoms & N. facing slopes:
phyllaries blackish green.
- Conservative treatment as
section *Alpinae*: Circum-
polar at high latitudes and
altitudes, split into
numerous apomictic
"species."

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

- Arnica nevadensis Gray: Sierras-Washington: 6600-11,900 ft.
- Antennaria rosea Greene (=A. dioica L. Gaertn. ssp. rosea): tips of phyllaries white to rose: N. Coast R.-Yolla Bolly Mts.-B. C.-Alaska-Ontario-Rocky Mts.-Sierras-San Bernardino-White Mts.: 4500-12,000 ft. Hall Area: Scattered colonies on S. facing slopes.
Conservative treatment as section Dioica: circum-boreal species complex at moderate latitudes. Apparently apomictic like preceding complex with similar complications.
- Arnica amplexicaulis Nutt.: Sierras-W. Montana-Alaska: 7000-10,600 ft.
- A. cordifolia Hook.: on dry, open S. slopes in Hall Area: S. California-Sierras-Modoc-Coast R.-Alaska-Rocky Mts.-N. Mexico: 3500-11,000 ft. (E. Plateau, Hall Area)
- A. longifolia Eat.: Sierras-Modoc-E. Oregon-Montana-Alberta: 5000-11,000 ft. Hall Area, E. Plateau, common
- A. rivularis Greene, det. by S. F. Blake. Hall Area, Cabin Creek, 10,250 ft.
- Artemisia ludoviciana Nutt. ssp. incompta (Nutt.) Keck, n=18: Santa Rosa-San Gabriel Mts.-Sierras-Modoc-Rocky Mts.: 2600-11,600 ft.; Hall Area: S. facing gravel slopes; highly variable; the species: San Jacintos-Sierras-Modoc-Washington-Alberta-Ontario-Arkansas-N. Mexico (1)

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

*Artemisia rothrockii Gray, n=18 in Hall Area; large heads in spicate inflorescences, succulent, leaves broadly cuneate, root sprouting: Sierras-Eldorado-San Bernardino-Panamint-White Mts.: 6500-11,500 ft.; on more settled slopes than A. tridentata (1)

Aster alpigenus T. et G. ssp. andersonii (Gray) Onno.: wet meadows, Sierras-Siskiyou-San Jacinto-Humboldt-S. W. Oregon-Washington: 4000-11,500 ft.

Chaenactis nevadensis Gray: Hall Area: gravel terrace, E. slope Mt. Conness, 11,700 ft.; along the Cascade-Sierran axis-Mt. Lassen-Tuolumne: 8300-10,200 ft.

Chrysopsis breweri Gray.: Sierras-Tulare-Siskiyou-Shasta: 4500-10,900 ft.: subalpine forest in Hall Area and quartz ledge on Middle Ridge, 10,100-10,500 ft.

Artemisia tridentata Nutt. n=9: Hall Area: loose sliding scree on steep S. Slope of E. Plateau: Sierras-Great Basin Plateau-Modoc-Siskiyou Co.-B. C.-Rocky Mts.-L. California: 1500-10,600 ft. Heads small, pedicellate. (1; George H. Ward: Artemisia. Dudl. Herb. 4:155-205. 1953)

Aster (Macheranthera) canescens Pursh. (=M. canesc. Gray): Hall Area: dry talus slopes and scree; E. side Sierras-San Jacinto-Modoc-Siskiyou-B. C.-Saskatchewan-Colorado-Arizona: 4500-9000 ft.; 11,000 ft. in Hall Area.

A. integrifolius Nutt.: Dry, S. facing slopes in Hall Area: L. California-San Jacinto-Sierras-Tulare-Plumas-Washington-Rocky Mts.: 4000-10,500 ft.

A. occidentalis Nutt. (=A. adscendens Jeps.): Drier situations than A. andersonii, but not so dry as A. integrifolius: 4000-11,700 ft. (1)

Chrysothamnus nauseosus (Pall.) ssp. albicaulis Hall et Clem.: Sierras, both sides of summit-B. C.-Saskatchewan-Texas-N. Mexico. Hall Area: S. facing rock cliffs to 10,800 ft.

C. parryi (Gray) Greene ssp. monocephalus (Nels et Kenn) Hall et Clem. Hall Area: Summit Ridge between Conness and E. Plateau, 11,300-11,600 ft. Low rounded, 15-20 cm-high bushes, giving the impression of an Andean puna. Species: California-N. Mexico-Nebraska. 7sspp; our ssp: Sierras-Tulare-Mariposa-Mono Cos.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

- Cirsium andersonii* (Gray) Jeps.; tall, erect, deep scarlet forest species, S. facing slopes in Hall Area to 10,600 ft.; Sierras-Tulare-Siskiyou-Trinity-S. W. Idaho-W. Nevada: 4000-10,500 ft.
- Crepis nana* Richs.: Hall Area; scattered on rocks to 10,800 ft.; San Gabriel-Panamints-Sierras-Alaska-Asia-Labrador: 8000-13,000 ft.
- **Erigeron petiolaris* Greene (=E. *algidus* Jeps.): common, showy rock plant in Hall Area; also in soil: to 12,500 ft., where a discoid form is found: Sierras-Mt. Whitney-Tahoe; 9000-12,000 ft. Endemic, high altitude Sierran species.
- E. *breweri* Gray: Deep-seated root crown from which ascending erect stems trail: Hall Area: dry rocky places, to 10,800 ft.; San Gabriel-San Bernardino-Sierras-Shasta-Lassen Co.: 5000-11,000 ft.
- *E. *pygmaeus* (Gray) Greene (=E. *nevadensis* var. Gray; =E. *radicatus* Hook.): low woody cushion plant, lavender flowers: Hall Area: White Mts., 11,600 ft.; higher Sierras-Whitney-Mt. Rose: 10,000-12,000 ft.
- Cirsium acaulescens* (Gray) Jeps. (=C. *drummondii* T. et G. ssp. *tioganum* Petrak.): a rosette with imbedded heads, flowers white. Hall Area: on exposed, open S. slopes: Sierras-Tulare-Mono-Inyo-Siskiyou-Modoc-B. C.-Saskatchewan-S. Dakota.
- Erigeron compositus* Pursh. ssp. *discoideus* Gray: low dense cushion plants. Hall Area: rocks gravel, to 11,000 ft. Species: San Gorgonio Mts.-Sierras-Washington-Idaho-Alaska-Yukon-Mackenzie-Melville Island-Ellesmere Island-N. E. Greenland-Gaspé-Rocky Mts.-Arizona: 8000-13,000 ft.
- E. *lonchophyllus* Hook.: annual to biennial, low plant Hall Area: alkali flat; San Bernardino-Sierras-White Mts.-Rocky Mts.-Alaska-Saskatchewan-Quebec: 6000-11,700 ft.
- E. *peregrinus* (Pursh.) Greene var. *callianthemus* (Greene) Cronq. (E. *salsuginosus* auth.): Hall Area: meadows to 10,500 ft.; Sierras-Tulare-Modoc-Trinity-B. C.-Alaska-Alberta-Colorado-N. Mexico: 5500-10,500 ft.
- Eupatorium occidentale* Hook. Hall Area: loose talus gravel, S. slope; 10,500-10,900 ft.: Sierras-N. Coast R.-Tehama-Washington-Idaho-Utah-Mohave-W. Nevada: 6500-11,000 ft.
- Gnaphalium palustre* Nutt.: Hall Area: slopes above CIW cabin: 10,500 ft.; tiny annual; cismontane-montane California-B. C.-Alberta-N. Mexico, up to 9500 ft. Annual.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

- **Haplopappus apargioides* Gray: Hall Area: alpine fell field, Middle Ridge, 10,650 ft.: Sierras-Tulare-Plumas-Mono Cos.-White Mts.: 7500-12,000 ft.
- Helenium bigelovii* Gray: N. Coast R.-Sierras-Lower California: 5000-11,000 ft.
- (*)*Hieracium horridum* Fries: Santa Rosa-San Jacinto Mts.-Sierras-Mt. Shasta-Modoc-Oregon: 9000-11,000 ft.; Hall Area: Scattered to 11,200 ft.
- (*)*Raillardella argentea* Gray. alpine pavements; prostrate, silvery. Hall Area: to 11,600 ft.: San Geronio-Sierras-Oregon. Dry, rocky sites.
- R. scaposa* Gray. Hall Area: meadows or gravel, to 10,500 ft.: Sierras-W. Nevada-Oregon, gravelly edge of meadows: 6500-11,500 ft.
- (*)*Senecio scorzonella* Greene (=S. covillei Greene): yellow flowers, discoid form; Hall Area: meadows to 10,800 ft.: Sierras N. to Mt. Lassen: 6000-11,500 ft.
- Gnaphalium purpureum* L.: Hall Area: along Slate Creek and above cabin; 10,200 ft.: Santa Barbara-Sierras-Washington-E. and central U. S. A. Annual-biennial.
- Haplopappus macronema* Gray var. *typicus* Hall; Hall Area: alpine ridges to 11,400 ft.: Sierras-Tulare-Nevada Co.-Warner Mts.-S. E. Oregon-Colorado: 9000-12,000 ft.
- Hieracium gracile* Hook. var. *detonsa* Gray: Hall Area: Scattered to 10,600 ft.: Sierras-Tulare-Tuolumne-Mono-Siskiyou-Trinity-B. C.-Rocky Mts.: 8000-11,000 ft.
- (*)*Hulsea algida* Gray: Hall Area: crevices among boulders, highest peaks; 11,300-12,400 ft.: Sierras-Mt. Whitney-Mt. Rose-White Mts.-Nevada-E. Oregon-Idaho-Montana: 10,000-14,000 ft.
- Microseris* (*Scorzonella*) *nutans* (Hook.) Sch. Bip. Hall Area: dry wooded ledges above cabin; 10,250 ft.: Sierras-Modoc-Siskiyou Co.-Coast R.-Humboldt-Trinity-B. C.-Rocky Mts.-Montana-Colorado: 4000-9500 ft.
- Senecio canus* Hook. Low, tufted white-woolly perennial; in Hall Area to 11,000 ft. in dry rocks: Sierras-Modoc-Siskiyou-B. C.-Rocky Mts.-White Mts.: 4200-11,750 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

(Cf. Circumpolar complex:)
(*Solidago vulgaris-multiradiata*:)
(In Hall Area: to 11,100 ft.;
Sierras-Cascades-Rocky Mts. -
Alaska: 8000-12,500 ft.)

- Senecio fremontii* T. et G. var. *occidentalis* Gray: Low, glabrate, semi-woody caudex; Hall Area: alpine slopes to 11,000 ft.: Sierras-Tulare-Alpine-Mt. Rose-Warner Mts. - B. C. - Idaho-Uintas in Utah-Wyoming: 9000-12,400 ft.
- S. *integerrimus* Nutt. var. *exaltatus* Nutt. (=S. *lugens* Rich. var. e.): Hall Area: tall, herbaceous, luxuriant plant; large, yellow-rayed heads; open slopes. Species: Sierras-N. Coast R. - Siskiyou-Modoc-White Mts. - B. C. - Alberta-Colorado: 2500-10,600 ft.
- S. *pauciflorus* Pursh.: heads cymose, discoid, florets saffron; herbaceous, erect perennial. Hall Area: moist meadow at 10,000 ft.; throughout Sierras-Alaska-Yukon-Labrador-Wyoming-Idaho: 8250-11,000 ft.
- S. *subnudus* D. C.: Hall Area: slender, having a single, subscapose, radiate, yellow-flowered head; moist meadows, along streams, to 10,500 ft. in Hall Area: Sierras-Washington-Montana-S. W. Alberta-Wyoming: 6500-10,500 ft.
- S. *werneriaefolius* Gray (=S. *muirri* Greene): loosely branched decumbent, semi-woody, trailing, stems; Hall Area: rocky ridges to 11,500 ft.: S. Sierras-Tulare-Fresno-Inyo-Mono-N. Mexico-Colorado-W. S. Dakota: 10,400-13,000 ft.
- S. *triangularis* Hook.; Hall Area: erect, luxuriant perennial, in or by wooded stream beds; triangular leaves, to 10,800 ft.: San Jacinto-Sierras-Coast R. - Trinity-Alaska-Rocky Mts.: 4000-11,250 ft.

HALL AREA, North American Species Complexes

II. PACIFIC COASTAL

III. GREAT BASIN-ROCKY MTS.

COMPOSITAE (cont.)

Wyethia mollis Gray; E. edge Hall
Area: Sierras-W. and E. slopes-
Siskiyou-adjacent Oregon-Nevada:
5000-10,000 ft.

Tanacetum canum Eat.: Hall Area:
rocky talus below perpendicular
cliff of E. Plateau; gray-canesc-
cent from woody crown: 10,600
ft.: Sierras-Tulare-Panamints-
S. E. Oregon: 9000-12,000 ft.

SUMMARY OF SPECIES

Following the arrangement in the floral list, the plants of the Hall Area are composed of the following number of species and species complexes, arranged in the order of their present natural distribution:

I. Circumpolar-circumboreal	72
II. Pacific slope	100 (incl. 32* high Sierran endemics)
III. Great Basin-Rocky Mts.	174 (incl. 6* scattered high alpine)
	<hr/>
Total	346 species + 4 interspecific hybrids

Group II contains 2 species that reach Alaska and one that reaches Chile. The partly catch-all group III has 29 complexes that reach Alaska, 12 that reach the Atlantic, and 2 that extend to both the Atlantic and Alaska; 4 of group III reach South America and Chile. One species complex, Erigeron compositus, extends to both Northeast Asia and Greenland but not to Europe, and is therefore not circumpolar. Distributional variations like these indicate the complexity of adaptation and history in elements of the plants of the world.

CONCLUSION

In the flora of the Harvey Monroe Hall Natural Area one is impressed by its richness of elements that have met here as the mountains have risen. Since no one was around during the couple of millions of years when it happened, we attempt roughly to interpret the situation as we see it. Classification of the

Hall Area Flora into three to four groups of species complexes is a crude attempt to visualize the movements of the plants in the past.

The detailed notes on individual clusters of species suggest that many sifting forces have interacted, as one can expect in anything alive and evolving, and indicate that this sifting process is still going on.

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Stanford, California
June 20, 1969

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